International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

http://ijpsat.ijsht-journals.org
Vol. 27 No. 1 Junio 2021, pp.237-242

# *Nutritional And Energy Value Of Non-Traditional Forage Plants For Cultivation In The Arid Zone Of Uzbekistan*

Bobokulov N.A.[1], Popova V.V.[2] and Rafiev B.Kh.[3]

[1]Professor, Doctor of Agricultural Sciences,

[2]Candidate of biological sciences,

[3]Researcher. Research Institute of Karakul Breeding and Desert Ecology.



**Abstract – The results are given on the nutritional and energy value of forage plants recommended for growing in the arid zone - millet, sorghum, quinoa, and mixed crops of millet, sorghum + soybeans. It was found that these plants have a high bioenergetic value and meet the zootechnical standards for fodder plants.**

**Keywords – Nutrients, Metabolizable Energy, Digestible Protein, Energy Value.**

An important reserve of the fodder base of Uzbekistan is the diversification of fodder crops well adapted to salt and drought tolerance in arid zones. In the arid zone of Uzbekistan, farmers need the introduction of new high-yielding, nutritious crops. The introduction of alternative crops with high nutritional value is seen as an important strategy to improve agricultural production and support local farmers - especially dependent on marginal land and water resources.

The unconventional, uncommon culture in the region today, the African millet (**Pennisetum giaucum**), is significantly superior to corn and other grain crops in terms of adaptive properties to varying degrees and types of soil salinity, grain yield and green mass. It has been established that millet can be grown as a main crop (when sown in April or early May) and as a secondary crop (sown in mid-June - early July). At the Uzbek Experimental Grain Growing Station (2006-2010), in cooperation with IKBA and IKRISAT, a promising double-purpose millet variety "**Hashaki**" was released, obtained as a result of crossing with the self-pollinating variety "**HHVBC tall**" and local varieties. This variety can be used as green forage in early spring and summer for all types of animals [1,3,4].

In experiments on animals, the nutritional and energy value of hay from African millet, variety "**Hashaki**", table 1 was established.

Table 1. Nutritional value of 1 kg of hay millet "Hashaki 1"

| № | Indicators | protein | fat | cellulose | NFES |
|---|---|---|---|---|---|
| **1.** | Nutrient content in 1 kg of feed according to chemical analysis, g. | 131,0 | 11,0 | 224,0 | 479,0 |
| **2.** | Digestibility coefficients,% | 52,6 | 37,6 | 48,6 | 1,0 |
| **3.** | Digestible nutrient content, g. | 64,2 | 4,2 | 103,0 | 263,5 |

**Corresponding Author:** Bobokulov N.A

| | | | | | |
|---|---|---|---|---|---|
| **4.** | feed units | 0,58 | | | |
| **5.** | Metabolic energy, MJ | 7,21 | | | |
| **6.** | Digestible protein, g | 68,9 | | | |

The digestibility coefficients of nutrients in hay "**Hashaki1**" from the whole plant, pre-chopped, turned out to be rather high when it was harvested in the flowering phase. 1 kg of such hay contains 0.58 feed units, 68.09 g of digestible protein and 7.21 MJ of metabolic energy , which is higher in energy value than hay from corn (0.57 feed unit, 57 g of digestible protein).

One of the oldest crops in world agriculture, sorghum (**Sorghum saccharatum pers**), in the sharply continental climate of Central Asia, is a reserve for increasing the fodder base of animal husbandry. Sorghum grain is a good concentrated fodder, green mass is used for silage, haylage, green fodder, hay, mono-fodder for making briquettes, granules, fodder blocks. After mowing, sorghum grows back and can be used for alternative landscapes for grazing animals.

In experiments on digestibility, the nutritional and energy value of sorghum hay was established.

Table 2.Nutritional value of 1 kg of sorghum hay.

| № | Indicators | protein | fat | cellulose | NFES |
|---|---|---|---|---|---|
| **1.** | Nutrient content in 1 kg of feed according to chemical analysis, g. | 130.4 | 12.0 | 177.0 | 502.6 |
| **2.** | Digestibility coefficients,% | 48.0 | 50.6 | 50.6 | 57.3 |
| **3.** | Digestible nutrient content, g. | 62.4 | 6.0 | 87.2 | 288.2 |
| **4.** | feed units | 0.50 | | | |
| **5.** | Metabolic energy, MJ | 6.76 | | | |
| **6.** | Digestible protein, g | 62.4 | | | |

Based on the data presented in Table 2, it can be concluded that sorghum hay is a highly nutritious roughage, is well eaten by animals and can be used as an alternative type of feed in the arid zone.

The fodder grown does not always meet the zootechnical requirements and feeding standards of farm animals, primarily in terms of carbohydrates, carotene, essential amino acids, the ratio of minerals, vitamins, which is one of the main reasons for the low productivity of animals. Experience shows that the improvement of technologies for the cultivation of forage crops and their mixtures can improve the quality and increase the digestibility of forage.

Cultivation of forage crops in joint - strip sowing (each component of **sorghum, millet, forage soybeans are sown** in separate rows), which contributes to the receipt of a feed balanced in protein and carbohydrates (Table 3). The amount of protein in the feed should be controlled by the carbohydrate-protein ratio, which indicates how many parts of the digestible carbohydrate and fat are in one part of the protein. One part of the protein should contain 6-8 parts of nitrogen-free extractives.

The energy value of hay confirmed that mixed crops allow to use the bioenergetic potential of plants to the fullest and receive balanced feed according to zootechnical feeding standards.

Table 3. Nutritional value of 1 kg of hay millet, sorghum + soy 2:1

| № | Indicators | protein | fat | cellulose | NFES |
|---|---|---|---|---|---|
| **1.** | Nutrient content in 1 kg of feed according to chemical analysis, g. | 113.0 | 28.0 | 185.0 | 55.6 |
| **2.** | Digestibility coefficients,% | 47.0 | 48.0 | 48.0 | 55.0 |
| **3.** | Digestible nutrient content, g. | 62.5 | 13.4 | 88.8 | 305.8 |
| **4.** | feed units | 0.61 | | | |
| **5.** | Metabolic energy, MJ | 7.01 | | | |
| **6.** | Digestible protein, g | 62.5 | | | |

The regulation of the quality of forage in band crops allows for a fuller use of soil fertility. The root system of cereals, legumes is formed in different layers, legumes improve the nitrogenous nutrition of plants. Sowing lodging and resistant plants makes the harvesting mechanism easier. These conditions make it possible to obtain a higher yield of feed, balanced according to zootechnical nutritional standards and to increase the use of feed energy with the greatest return.

One of the traditional and widespread plants in the arid zone is naked licorice (Glycyrrhisa glabra L.). The main licorice thickets are located in the lower reaches. Amu Darya, on the territory of the republic it is found along irrigation ditches and canals. On pasture, licorice is used by animals for grazing mainly in the autumn-winter period.

Licorice gives a high yield of fodder mass up to -5.0 t / ha in the phase of budding and the beginning of flowering, and by autumn it gives aftertava up to 0.5-1.0 t / ha. Therefore, it can be cleaned twice a year.

Licorice hay harvested in different phases of the growing season (flowering, fruiting) has significant differences in overall nutritional value. The content of digestible protein in late-harvest licorice hay decreases especially strongly - from 50.7 g in hay in June harvest to 30.7 g in hay harvested in October.

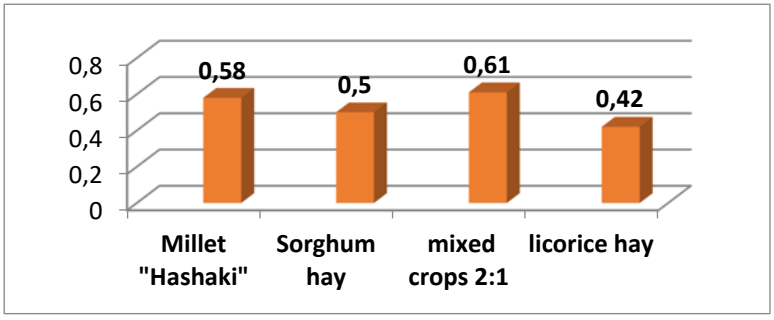
Table 4. Nutritional value in 1 kg of licorice hay, harvested in the flowering phase.

| № | Indicators | protein | fat | cellulose | NFES |
|---|---|---|---|---|---|
| **1.** | Nutrient content in 1 kg of feed according to chemical analysis, g. | 132.0 | 48.0 | 334.0 | 417.0 |
| **2.** | Digestibility coefficients,% | 52.7 | 78.0 | 32.8 | 67.8 |
| **3.** | feed units | 0.42 | | | |
| **4.** | Metabolic energy, MJ | 4.89 | | | |
| **5.** | Digestible protein, g | 50.7 | | | |

Based on the data presented in Table 4, it can be concluded that licorice hay is a highly nutritious food with a high content of digestible protein. The best time for harvesting can be considered the flowering phase, when the plant accumulates a large amount of nutrients and is readily eaten by animals.

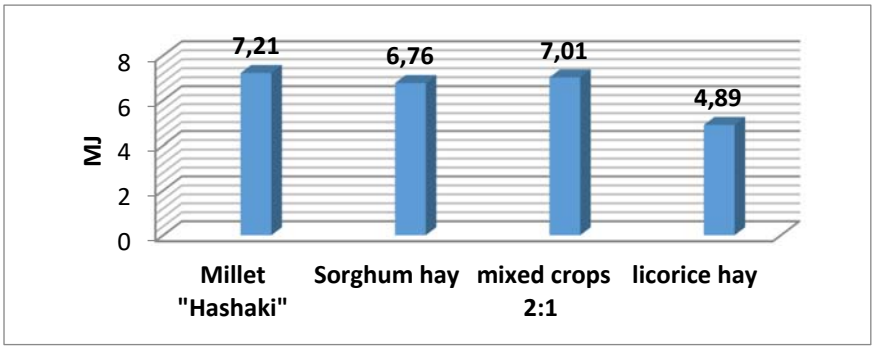
However, it should be borne in mind that licorice hay has a high estrogenic effect, negatively affects the reproductive functions of animals. Taking into account the high estrogenic activity of licorice naked, special studies are needed to establish the amount of licorice hay permissible for feeding without disturbing the physiological functions of the animal.

Summarizing the obtained data, it can be noted that the highest energy value of hay was observed in a mixture of millet, sorghum + soybeans, 2: 1, and millet "**Hashaki 1**", and amounted to 0.61 and 0.58 feed units, respectively (picture 1). Its lowest indicator was in licorice naked - 0.42 fodder unit.



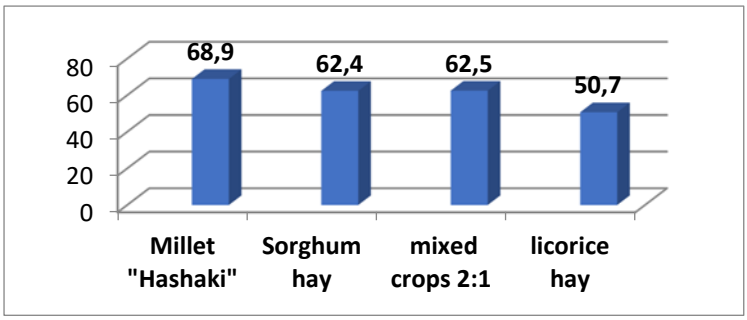

Picture 1. Total energy value in 1 kg of feed (hay of African millet "Hashaki 1"; sorghum; mixture of millet. Sorghum + soybeans, 2:1; naked licorice), feed units.

As for metabolic energy, which is one of the bioenergetic characteristics of feed, its highest indicator was observed in hay of millet "Hashaki1" - 7.21 MJ, the lowest in licorice - 4.89 MJ (picture 2). The exchange energy of a mixture of millet hay, sorghum + soybeans, 2: 1, as well as sorghum hay differed slightly from each other and amounted to 7.01 MJ and 6.76 MJ.




Picture 2. The content of metabolic energy in 1 kg of feed (hay of African millet "Hashaki 1"; sorghum; mixture of millet, sorghum + soy, 2:1; naked licorice), metabolic energy, MJ .

The lowest content of digestible protein was shown in licorice hay, and was 50.7 (picture 3). The highest, as in terms of exchange energy, was observed in millet "Hashaki 1" - 68.9. However, it should be noted that the content of digestible protein in the hay of all tested plant species did not differ significantly from each other.




Picture 3. Digestible protein content in 1 kg of feed (hay of African millet "Hashaki 1"; sorghum; mixture of millet, sorghum + soy, 2:1; licorice).

Thus, despite the differences in bioenergetic parameters, all tested plant species characterized themselves as good highly nutritious feed.

**Quinoa** is one of the multipurpose agricultural crops that can adapt to difficult climatic and soil conditions. The whole plant goes to feed livestock and birds, and the seeds are used to feed people. Waste from the production of seeds - chaff and large parts of plants are crushed, fed to all types of animals.

We tested the cultivar with Quinoa samples and collected plant samples at various stages of the growing season. The resulting crop at the stage of panicle formation was fed to sheep without preliminary preparation. With group feeding, the eatability was 100%, no residues remained in the feeders. The Quinoa Q3 bush harvested in the phase of milky-wax ripeness contained 40.8% of a well-edible mass, most of which consisted of inflorescences (32.6%). In Quinoa Q5, the well-eatable portion was 60.3%. Thick stems ranged from 39.4-59.2%, which are recommended to be chopped for better eating by animals. Below is a table based on chemical analysis data.

Table 5. Chemical composition of grade Quinoa samples, %

| Plant Fraction | Crude Ash, % | Crude Fat, % | Crude Fiber,% | Crude Protein ,% | NFES % | Gross energy, k / cal |
|---|---|---|---|---|---|---|
| $Q_5$-inflorescence | 1.3 | 1.76 | 0.28 | 3.32 | 92.73 | 4348.9 |
| $Q_5$- leaves | 1.6 | 0.28 | 8.90 | 10.85 | 77.05 | 4329.4 |
| $Q_5$- stem | 3.2 | 0.22 | 11.14 | 8.2 | 76.98 | 4268.7 |
| $Q_3$-inflorescence | 1.2 | 0.96 | 0.20 | 1.8 | 95.84 | 4319.8 |
| $Q_3$- leaves | 1.12 | 0.28 | 7.68 | 8.75 | 81.59 | 4353.7 |
| $Q_3$- stem | 2.8 | 0.22 | 9.80 | 4.9 | 82.28 | 4254.2 |
| $Q_3$- twigs | 2.11 | 0.50 | 6.90 | 5.6 | 84.90 | 4307.5 |
| Control leaves of white quinoa | 1.4 | 0.32 | 8.20 | 12.95 | 76.05 | 4377.6 |
| Control stem of white quinoa | 3.12 | 0.28 | 10.02 | 9.1 | 77.48 | 4298.0 |

According to the data obtained (table 5), the leaves are especially rich in nutrients, which contain 8.75-10.85% of protein and the least amount of fiber, 7.68-8.90%. The amount of carbohydrates (NFES) contains more in the inflorescences 95.84-92.73%. The plant stems had a lower amount of protein 4.9-8.2%, but since they are 39-59% by weight in the plant, they are an important component of the Quinoa plant in terms of nutritional value.

Thus, the content of nutrients in Quinoa by morphological fractions has significant differences, the caloric content of the whole plant is in the range of 4268.7-4298.0 kcal.

## CONCLUSIONS

Summarizing the above and comparing the energy value of non-traditional plants grown in the arid zone, it can be noted that these plants have a high bioenergetic value and meet zootechnical standards for fodder plants. The introduction of these crops with high nutritional value in combination with salt tolerance will certainly be of great importance in solving two interrelated problems - soil salinization and strengthening of the forage base.

## REFERENCES

[1]Bobokulov N.A., Popova V.V. Nutritional value of African millet and sorghum grown in Uzbekistan. International symposium “Protection of the bio-noosphere, ecology. Non-traditional plants, ecology and medicine", Simferopol, Russia, October, 2013.

[2]Popova V.V., Bobokulov N.A. Nutritional and energy value of a new variety of African millet "Hashaki", Samarkand Agricultural Institute, Republican Scientific and Practical Conference "Integration of Science and Production - an Important Factor of Agricultural Efficiency", Samarkand, 2013, p. 19-22.

[3]Toderich K.N. and others (2011). New variety of millet zoned in Uzbekistan. CAC News. № 49-50, p 9-10.

[4]Toderich K.N. (2012) Crop Diversification in Central Asia: Sorghum and Millet. CAC News № 51-52, p 9-11.